# 2009 Update to Crested wheatgrass control and monitoring Benton Lake Refuge

Service Unit: Benton Lake NWR
Reporting Office: Benton Lake Complex
Species or group: Upland habitat - invasives
Title: Crested wheatgrass control and monitoring
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This is a summary for 2009 – for full details on the study please see the 2008 report.

## I. Materials and Methods

A pilot program to begin testing treatment effectiveness was started in 2008. One management unit of the refuge was chosen to treat established stands and pioneer CWG (Figure 1).

### *Pioneers*

The same portion of the pilot area that was treated for pioneer plants in 2008 was re-treated in 2009 by field technicians with backpack sprayers (Figure 1). The technicians walked back and forth across the treatment area systematically spraying pioneer plants. Glyphosate (1:2 mix of glyphosate:water) was applied to individual plants at a rate of 1.1 kg active ingredient/ha (Wilson and Partel 2003). We added a dye to make it easier to track coverage. Herbicide was applied at the 3-4 leaf stage, pre-seed in mid-June (06-18-09).

In addition, the remainder of the pilot area and two additional management units were treated for pioneer plants using the same technique by a Montana Conservation Corp crew. The seven person crew treated 348 acres of native prairie from July 7 – 13, 2009 (Figure 1- inset). During this time, the crested wheatgrass plants were in a later stage, flowering to nearly senescing.

### *Established Stands*

Fortunately, at Benton Lake, much of the established CWG infestations are adjacent to road-sides. In the pilot area, the established CWG stands were evenly divided into 9 subplots of approximately 1 acre each. We divided the 9 plots into blocks of 3 subplots each from north to south and then randomly assigned one subplot in each block of three to either a mowing treatment, herbicide treatment or no treatment (control) (Figure 1).

### *Mowed subplots*

We mowed CWG at the four leaf stage, just prior to seed head emergence, in early June (06-05-09). All plots were mowed with the bat-wing mower on the back of the tractor. Unfortunately, during the first mowing, the mower was not at its lowest setting. We tried to re-do the early mowing, but only got one strip on 2-C next to the road mowed before the mower broke. The second mowing, three weeks later (06-23-09), was more successful, but some plants had already gone to seed.

*Herbicide subplots*

Glyphosate (1:2 mix of glyphosate:water) was applied to individual plants at a rate of 1.1 kg active ingredient/ha from a boom sprayer attached to an ATV at the 3-4 leaf stage in late May (05-26-09). Winds were <10mph, it was sunny and partly-cloudy. Herbicide treatments were completed in one day (Figure 2).

*Monitoring*

Pioneer plants

We marked 20 pioneer plants that were treated. Ten of the plants were the same ones treated in 2008 and 10 additional plants treated in 2009. The total number of pioneer plants treated by both the strike team and the MCC crew were counted by individuals as they sprayed.

Established stands

To monitor the effectiveness of these treatments we randomly established two 20m x 0.1m belt transects centered on, and perpendicular to, the invasion front for each subplot (Grant et al 2004). Each 0.5 x 0.1m section of the belt transect was assigned to one of three categories based on dominant vegetation (>50%): (1) native, (2) crested wheatgrass (3) other. From these we will be able to detect the spread of CWG into native prairie and/or the spread of native prairie back into the prior CWG stand. Percent cover of natives and CWG were estimated at the 0, 5, 10, 15 and 19m points along the belt transect using 1 x 0.5m frame (Daubenmire 1959). Data was collected in 2008 pre-treatment and transects were revisited in 2009 just prior to treatment.

## II. Results

Pioneer plants

As of the writing of this report, the individually marked pioneer plants have not been revisited. They will be visited in May 2010 to check for survival.

In the pilot area, 2013 crested wheatgrass plants were treated by the Strike Team and 2943 by the MCC crew for a total of 4956. In upland Unit 2-b 8393 plants were treated. In upland unit 1-C 16,357 individual plants were treated.

In 2010 these upland units will be re-surveyed to determine if the population has decreased.

Established stands

The community-level composition data for the belt transects placed at the CWG invasion front is shown in Figure 3. In the control and mowed plots, the percent native decreased by 2%. In the herbicide treated plots, the percent native increased by 7%. Other vegetation community types detected on the transects include bareground (predominantly on the herbicide treated - CWG side) and Japanese brome (predominantly on the native prairie side).

Percent cover measured in the smaller frames is shown in Figure 4. The frame at 10m is approximately at the invasion front. As expected, the frames outside the CWG stand (0m, 5m) had primarily native and those within the stand (15m, 19m) had primarily CWG. The percent of native cover increased in all treatments, but the largest increase was in the herbicide treated plots.

## III. Discussion

We continue to learn about treating crested wheatgrass and restoring native prairie. The herbicide treatments appeared to be more effective this year. We will be checking closely in 2010 to see if we have 100% mortality. If so, we will likely begin seeding native plants either in fall 2010 or spring 2011. Some forbs seem to survive the glyphosate treatments. If we are lucky, perhaps some native grasses will colonize the treated sites on their own.

Mowing continues to be effective at preventing seed formation. We have had good precipitation the last couple of years which may be mitigating some of the stress we hoped to be placing on the CWG plants. It may be that an effective future treatment will be 3 years of mowing to clean up the seed bank, follow up with 1-2 years of herbicide treatment and then seeding with native species.

Plans for 2010

Treat (and count) pioneer plants within the pilot area again this year using the Strike team. Survey any untreated areas to determine if total number of pioneer plants are decreasing.

If time allows, survey the other two management units treated by the MCC in 2009 to determine if plants have been reduced.

Treat any surviving CWG plants in the herbicide plots. Seed with natives this fall or next spring. Repeat mowing in the “mow” plots.

Continue monitoring transects along the invasion front.

## IV. Literature citations


Ambrose, LG and SD Wilson. 2003. Emergence of the introduced grass *Agropyron cristatum* and the native grass *Bouteloua gracilis* in a mixed-grass prairie restoration. Restoration Ecology 11(1): 110-115.

Bakker, JD, SD Wilson, JM Christian, X Li, LG Ambrose and J Waddington. 2003. Contingency of grassland restoration on year, site, and competition from introduced grasses. Ecological Applications 13(1): 137-153.

Cook, CW and LA Stoddart. 1952. Some growth responses of crested wheatgrass following herbage removal. Journal of Range Management (X): 267-270.

Daubenmire, R. 1959. Canopy-coverage method of vegetational analysis. Northwest Science 33:43-64.

Grant, TA, EM Madden, RK Murphy, KA Smith and MP Nenneman. 2004. Ecological restoration. 22(2):106-112.

Hansen, MJ and SD Wilson. 2006. Is management of an invasive grass *Agropyron cristatum* contingent on environmental variation? Journal of Applied Ecology 43:269-280.

Lloyd, JD and TE Martin. 2005. Reproductive success of chestnut-collared longspurs in native and exotic grassland. The Condor 107:365-374.

Owens, MK and BE Norton. 1990. Survival of juvenile basin big sagebrush under different grazing regimes. Journal of Range Management 43(2): 132-135.

Roundy, BA, GJ Cluff, Jk Mcadoo and RA Evans. 1985. Effects of jackrabbit grazing, clipping and drought on crested wheatgrass seedlings. Journal of Range Management 38(6): 551-555.

Stutzman, E. 2002. Species diversity in crested wheatgrass versus native prairie. Unpublished report, Benton Lake Refuge files.

Wilson, SD and M Partel. 2003. Extirpation or coexistence? Management of a persistent introduced grass in a prairie restoration. Restoration Ecology 11(4):410-416.

Zlatnik, E. 1999. Agropyron cristatum. In: Fire effects information system [online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis

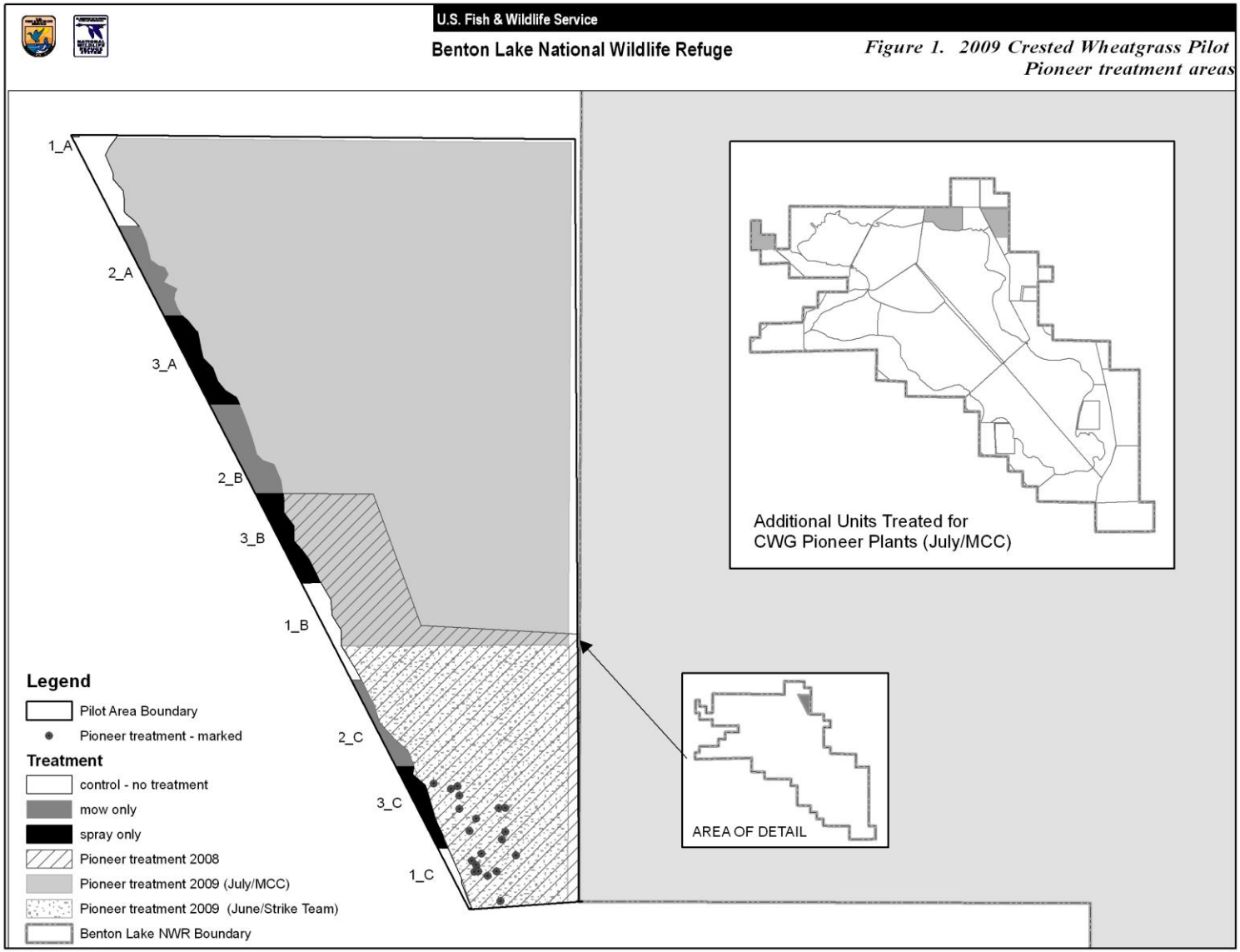
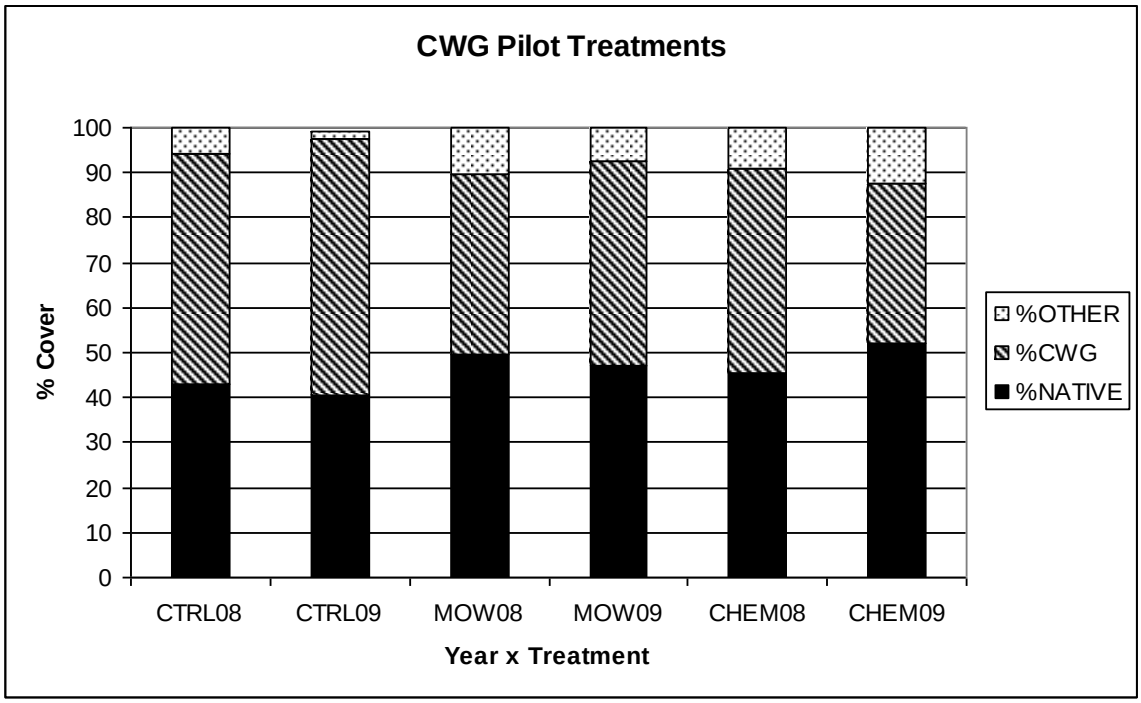



*Figure 1. 2009 Crested Wheatgrass Pilot Pioneer treatment areas*

Figure 2. Much better coverage this year with herbicide treatments. Western wheatgrass growing in herbicide treated plots.

Figure 3. Baseline vegetation composition of belt transects placed at the invasion front for two treatments and control.



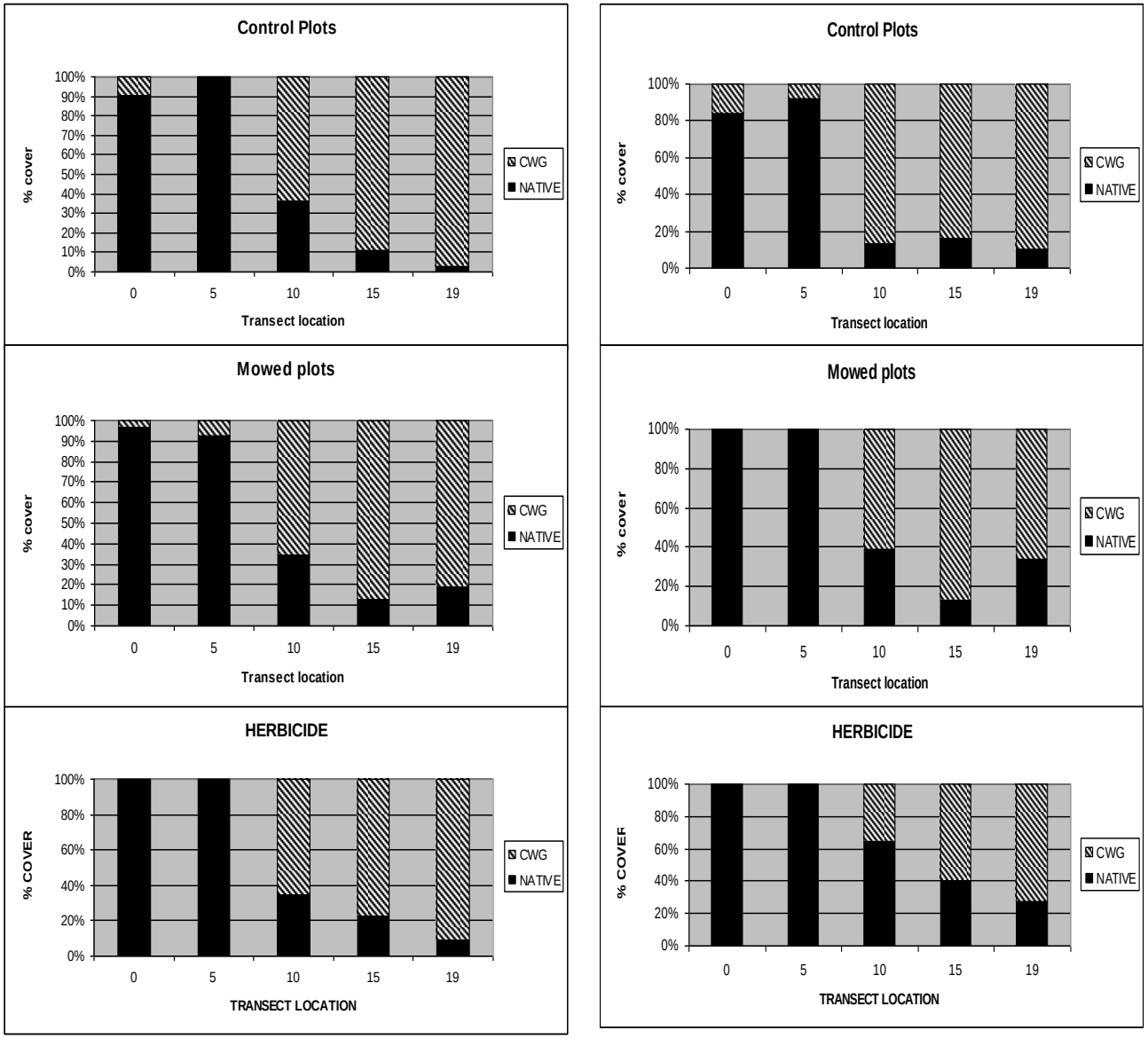



Figure 4. Changes in percent cover within transects (2008 left, 2009 right). Percentage of native cover increased in all treatments, but the greatest increase was in the herbicide treated plots.